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GEOPHYSICAL YEAR INFORMATION
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SOVIET BLOC INTERNATIONAL GEOPHYSICAL YEAR INFORMATION

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I. GENERAL

Expanded Reports Sessions of the Scientific Council of the Institute of the Physics of the Atmosphere

An expanded reports session of the Scientific Council was held from 3 to 5 March 1958 in the Institute of the Physics of the Atmosphere. The session was opened by an address of A. M. Obukhov, Corresponding Member of the Academy of Sciences USSR, director of the institute, in which was described the basic direction of the work of the institute.

The session, devoted to the problems of atmospheric optics, was opened by G. V. Rozenberg's report "Investigation of the Optical Properties of the Atmosphere," in which he briefly described the principal contemporary directions of atmospheric optics and the content of the work stemming from these being conducted in the Laboratory of Atmospheric Optics of the Institute of the Physics of the Atmosphere.

The report "Certain Problems of Transmission of Radiation in the Atmosphere in the Presence of Horizontal Inhomogeneities" was given by M. S. Malkevich. The problem of the radiation regime was considered on the assumption of a change in the albedo of the underlying surface along horizontals. The characteristics of radiation scattering were calculated by the author for a homogeneous (according to altitude) and isotropically scattering atmosphere. Conditions for application of Eddington and Chandrasekar approximation methods were also investigated.

Ye. M. Feygel'son presented the results of a theoretical study of the cooling process of the upper part of a cloud. The cloud was considered as a horizontal, infinitely extended layer of finite thickness, with distribution of temperature, water content, and humidity given for the initial moment. The initial distribution of temperature and humidity was given for above the cloud. The heat flux from the cloud attributed to the transfer of long wave radiation and to phase conversions was considered. Numerical examples show that the cloud's upper part cools off approximately 0.2-0.3 degree per hour, and the layer over the cloud, somewhat more slowly; an inversion of the temperature over the cloud takes place; the nature of the cooling depends on the humidity of the layer over the cloud; and that the influx of heat attributed to condensation is small in comparison to that attributed to radiation.

G. V. Rozenberg reported the preliminary results of an experimental study of polarization scattering indicatrices which he conducted jointly with N. D. Rudometkina and I. M. Mikhaylin. It was revealed that the study of polarization scattering indicatrices substantially increases the volume of information concerning scattering substances. While processing data obtained in 1956 near Moscow (in weak fog conditions) and in 1957 in the northern Caucasus (in dust-laden air conditions), the ellipticity of polarization of the scattered light was discovered and a number of peculiarities in the matrices of scattering, characterizing the optical properties of the scattering medium were explained.

A. Ya. Drivina and N. V. Zolotavina gave some results of the work of the atmosphere-optical expedition of 1957.

Under the expedition's program, measurements of the intensity, the degree of polarization, and the direction of polarization of light from different parts of the day sky were conducted in the foothills of the Northern Caucasus. Appropriate data were obtained on the function of the angle of scattering for various almucantars and in the Sun's vertical. Measurements of day and night transparencies of the atmosphere and also the horizontal transparency of the ground layer of the air were made with two filters ($\lambda_{\text{Eff}} = 466\text{m}\mu$, $\lambda_{\text{Eff}} = 536\text{m}\mu$). The optical thickness of the atmosphere in the region of the expedition's operations varied during observations from 0.116 to 0.527 for the blue filter and from 0.207 - 0.424 for the green filter.

The session, devoted to the problem of atmospheric turbulence was opened with a report by A. M. Obukhov, "Work on the Problem of 'Atmospheric Turbulence.'"

Afterwards, the assembly heard A. S. Monin's and A. M. Obukhov's report, "Small Fluctuations of the Atmosphere and a General Statement of the Problem of Adaptation." A classification of the principal types of dynamic processes in the atmosphere (horizontal vortex motions, gravitational and acoustical waves) is given in a very general form on the basis of the solution of the problem of small fluctuations of a baroclinic atmosphere, and the "filtering" role of a quasistatic approximation is explained. It was shown in particular that the time for the establishment of a quasistatic balance in the atmosphere consists of several minutes.

L. A. Dikiy reported on the results of the study of small fluctuations of a polytropic atmosphere.

V. I. Titanskiy presented the results of experimental investigations of flickering in light from ground sources, which were conducted by A. S. Curvich and L. R. Tavang. The statistical characteristics of flickering of light sources located in the ground layer of the atmosphere were measured: $\sigma^2 = (I - \bar{I})^2$ (where I is the intensity of the light flow), the three-dimensional correlation function R of fluctuations of I , the frequency spectrum of fluctuations of I in the 0.05-1,000-CPS range, and the probability distribution function of fluctuations of I . Measurements were made for the distance L between the illuminator and the light receiver from 250 to 2,000 meters and for different meteorological conditions. The following relationships were obtained: (a) $\sigma^2 \sim (\Delta T)^2$, where ΔT is the difference of the mean temperatures at 2 altitudes ($\Delta T \sim 0.4$); (b) $\sigma^2 \sim L^2$, where $\eta \sim 2$; (c) experimentally confirmed the theoretical conclusion that the radius of the correlation of fluctuations in the intensity is determined by the value $\sqrt{\lambda L}$; (d) the probability distribution function is close to a log-normal distribution; and (e) the form of the frequency spectrum of fluctuations in the intensity of light qualitatively agrees with the spectral density fluctuations obtained theoretically.

V. M. Bovsheverov described apparatus developed in 1958 by the Laboratory of Atmospheric Acoustics for measuring the principal statistical characteristics of occasional processes: spectrum analyzer; an integral type level analyzer; and a comparator an instrument for measuring dispersion and structural functions.

V. I. Krasovskiy made a brief report on the problem of "Physics of the Upper Atmosphere", which characterized the modern state of the problem, and, based in connection with this, was a thematic plan of the Upper Atmosphere Division of the Institute of the Physics of the Atmosphere.

V. I. Krasovskiy read "Recharging of Proton," a report by I. S. Shklovskiy, explaining a theory developed by the author that included in the composition of the Sun's corpuscular flows, which cause aurorae, and also in geomagnetic and ionospheric disturbances, are neutral hydrogen atoms which are formed in interplanetary space as a result of the recharging of fast solar protons with neutral gas.

A report by Ya. G. Birefel'd, "Radar Images from Aurorae," presented a great deal of observation material and some of the authors views on the nature of radar images from aurorae.

N. I. Fedorova gave the results of measurements of the distribution of the intensity in the rotational-oscillatory spectrum of hydroxyl for determining temperatures of the upper atmosphere.

A report by V. S. Prokudina was devoted to a consideration of the peculiarities of hydrogen emission in low-latitude aurorae. ("Expanded Reports Session of the Scientific Council of the Institute of the Physics of the Atmosphere," by F. F. Yudalevich; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 10, Oct 58, pp 1262-1263).

Conference of Young Specialists of Institute of Physics of the Atmosphere

A conference of young specialists was held from 6 to 7 March 1958 in the Institute of the Physics of the Atmosphere, Academy of Sciences USSR after the close of the Reports Session of the Scientific Council of the Institute.

The opening address was given by Ye. M. Feygel'son, senior scientific associate.

A review of observational material obtained at the North Scientific Station was given in the report "Spectroscopic Investigation of Auroras," by Yu. I. Gal'perin. It was discovered that in a number of cases, hydrogen lines are observed prior to the appearance of any indications of an aurora and only one to 2 hours after this, did a strong radiance appear. As a result of an analysis, 131 spectrograms of the hydrogen patrol service with an exposure of one hour, established a noticeable correlation in the appearance of hydrogen luminescence with the appearance of radio reflections from aurorae on a wave length of 4 meters. A theory on the form of hydrogen emission of aurorae was constructed.

The results of observations of radar images from aurorae in the North Scientific Station of the Institute of the Physics of the Atmosphere, Academy of Sciences USSR, particularly, the distributions of radio reflections at frequencies of 30 megacycles and 72 megacycles and the diurnal variation of the reflections for three months were given in the report "The Nature of Radio Reflections from Aurorae," by A. I. Grachev.

A report by N. V. Dzhardzhio, "Electrophotometry of Emissions in the Zone of the Aurorae," contained a description of apparatus used for electrophotometric studies of emissions of aurorae and illumination of the sky, and the results of observations performed with it. A comparison of the intensity of emissions in the zone of the aurorae and in southern latitudes, and also the electrophotometric investigation of wind movements and pulsations of intensity in the zone of the aurorae were given.

A. V. Korotin reported the results of the processing of spectra obtained at the North Scientific Station using a patrol spectrograph in the report "Classification of Auroral Spectra."

V. I. Pogorelov spoke on the results of the studies of radar images of aurorae at Roshchino.

"Temperature of the Atmosphere at the 100 Kilometer Level According to Spectra," by V. S. Prokudina, was devoted to a discussion of the spectral method of determining temperatures of the upper atmosphere according to rotational bands of hydroxyl also obtained by reporters of experimental data.

In the report "Continuous Emission Spectrum of the Upper Atmosphere," N. N. Shefov discussed the results of measurements of the relative and absolute intensities of the basic emissions of the night sky and considered the problem of errors introduced by the continuous spectrum in determinations of the intensities of emissions with the use of interference filters.

A. B. Kazanskiy presented a paper on the regime of turbulence of the ground layer in conditions of unstable atmospheric stratification. The basic results of a theory of similarity in the ground layer of the atmosphere are explained. From measurement considerations, expressions for the turbulent flow of heat q and the coefficient of turbulence k , are reduced. A general case of unstable atmospheric stratification is considered. The form of the universal function $f(\xi)$ for the entire range of values of Richardson numbers (Ri) is examined. A method of processing the results of gradient measurements is proposed. A nomogram for determination of the flow of heat q is suggested.

A. S. Gurvich spoke on a distribution analyzer, developed by himself, which is intended for finding the distribution probabilities of occasional processes. ("Conference of Young Scientists of the Institute of the Physics of the Atmosphere, Academy of Sciences USSR," by F. F. Yudalevich; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 10, Oct 58, pp 1263-1264)

II. ROCKETS AND ARTIFICIAL EARTH SATELLITES

Nesmeyanov Places Special Emphasis on Space Research Under New 7-Year Plan

Academician Aleksandr Nesmeyanov, president of the Academy of Sciences USSR, in a long Pravda article on the problems facing Soviet science under the new Seven-Year Plan, had this to say regarding the study of space:

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"In the Seven-Year Plan for the development of science, considerable attention will be given to the development of new means of astronomical investigations, both with the aid of new powerful optical and radio instruments, as well as through the use of cosmic rockets and artificial earth satellites, with which it will be possible to place instruments beyond the Earth's atmosphere." ("Tasks of Soviet Science in the Light of the Seven-Year Plan for the Development of the Economy of the USSR," by Academician A. Nesmeyanov, president of the Academy of Sciences USSR; Moscow, Pravda, 1 Dec 58)

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Pokrovskiy Proposes Creation of Artificial Atmosphere for Moon Landings

The creation of an "artificial atmosphere" which would enable space ships to land on the Moon and other planets where an atmosphere is lacking, is proposed by Professor G. I. Pokrovskiy, Doctor of Technical Sciences. The large fuel reserves necessary for braking actions using jets can be eliminated in the use of Pokrovskiy's method.

Pokrovskiy proposes to create this "atmosphere" in this manner. As the space ship approaches the Moon's surface, it will launch a small missile forwards. This missile will outdistance the space ship and strike the Moon's surface with meteoric velocity. As is known, the lunar surface is covered with a thick, loose layer of dust. Under the impact of the missile, at a tangent to the surface, enormous amounts of this dust will be thrown upwards and since high temperatures will develop upon impact, part of this dust will evaporate and form a cloud of rather dense gases.

The space ship must approach the Moon's surface almost at a tangent. Thus it will remain for a relatively long time near the surface, penetrating the clouds of dust and gases. To increase the braking effect a curved vane can be extended to catch the dust and, gases and changing their direction, throw a powerful jet forward at a speed greater than that of the ship. This jet can be directed downwards so that in hitting the Moon's surface it will continuously raise up new masses of gas and dust before the ship. Thus the cosmic ship will always move in a dense atmosphere along its flight path.

It is also possible that the space ship will not be braked sufficiently in approaching the Moon to effect a landing but will be carried a great distance beyond it.

Describing an elliptical orbit it will again approach the lunar surface. Several such approaches using small jet motors for corrections in the trajectory of the flight, will slow the ship down sufficiently for a landing in the dust layer similar to the "belly landings" made by airplanes. Such landings, says Pokrovskiy, should not be too difficult.

It is obvious, he continues, that in order to arrive at a more exact solution of the problem presented here, it is necessary to bombard the Moon with special rockets which will skid along the surface of the Moon at edge of the visible disk so that the clouds of dust thus created will be clearly visible against the dark background of cosmic space. It will also be possible to observe these clouds both by the impacts on the Lunar surface, as well as by the angular illumination of the Sun which causes dark shadows to be cast by the clouds. Finally, it will be useful to also launch rockets in the region of the lunar surface not illuminated by the Sun in order to observe the illumination of glowing gases formed as the rockets skid along the surface of the Moon. ("Moon Landings," by Prof G. I. Pokrovskiy, Doctor of Technical Sciences; Moscow, Tekhnika Molodezhi, No 11, Nov 58, pp 3-4)

Sputnik III Encounters Meteor Showers

V. Lutskiy, Scientific Associate of the Moscow Planetarium, reports that several days ago, Sputnik III transmitted particularly frequent signals concerning its collisions with meteor bodies.

From 10-16 November, the Earth and Sputnik III passed through the Leonids shower. Earlier, from 14 to 26 October, Sputnik III passed through the powerful shower of the Orionids.

In the first half of December the Earth and the artificial earth satellite will pass through the very powerful shower of the Geminids.

Several piezoelectric transducers are carried by Sputnik III for recording the number of micrometeor impacts. These instruments are so sensitive that they can detect the impact of particles with a diameter of one micron and a mass of one billionth of a gram. ("Satellite Passes Through Meteor Shower," by V. Lutskiy, Scientific Associate, Moscow Planetarium; Moscow, Vechernyaya Moskva, 24 Nov 58, p 3)

Unidentified Flying Object Observed in Finland

Five persons in the Kajana District observed a "flying cigar" in the sky at 2230 hours on 18 November. The object, which emitted a loud noise and lighted up a large area, moved from northeast to southwest and was visible for 2 or 3 minutes.

Strange lights have been observed in the sky in Kainuu. ("Flying Cigars in Kainuu"; Helsinki, Hufvudstadsbladet, 22 Nov 58, p 1)

III. UPPER ATMOSPHERE

Kozyrev, Soviet Astronomer, Makes new Discovery

Hitherto unknown forces acting on the Earth's axis of rotation are reported to have been discovered by N. Kozyrev, Doctor of Physicomathematical Sciences, the Pulkovo astronomer who recently revealed the discovery of volcanic activity on the Moon [see Soviet Bloc IGY Information, No 42, 28 November 1958].

The scientist, as far back as 1949, used astronomical photographs in making measurements of the shape of the hemispheres of the rapidly rotating planets Jupiter and Saturn. It was found that the northern hemispheres of these planets, as is the case on the Earth, are more compressed than their southern hemispheres.

Kozyrev developed an original system of mechanics, on the basis of which he arrived at the conclusion that peculiar, previously unknown, forces act on the axis of the rotating bodies. These forces cause variations in time. The existence of these forces on the Earth's surface were established by Kozyrev as a result of experiments conducted last year at the Pulkovo observatory. This special method of measuring forces proposed by the scientists, was also applied by him for the Arctic Circle in Kirovsk and in the Crimea this year. The measurements supported his hypothesis that these previously unknown forces actually are directed on the Earth's axis of rotation and that their magnitude depends on the geographical latitude. ("Interesting Work of a Leningrad Astronomer"; Moscow, Izvestiya, 22 Nov 58, p 4)

Khar'kov Observatory Preparing Moon Atlas For Space Travelers

N. Barabashov, active member of the Academy of Sciences Ukrainian SSR and director of the Khar'kov Astronomical Observatory, reveals that work is going on at the observatory on the compilation of a Moon atlas. The atlas will contain the most minute details of the lunar surface, the heights of mountains, gradients of the slopes of craters and cirques, and other data. The atlas is being prepared, says Barabashov, for use by the first cosmonauts. The study by the observatory also aims at a knowledge of the physical conditions on the Moon, its atmosphere, temperature, etc., which will make it possible to provide the proper equipment for those first landing on its surface.

According to Barabashov, V. I. Enzelskiy, an associate of the Khar'kov observatory, had a part in the discovery of volcanic activity on the Moon, which was reported by Dr M. A. Kozlov, of the Pulkovo observatory [See Soviet Bloc TGN Information, No 42, 26 November 1958].

In conclusion Barabashov says that through the efforts of Soviet scientists, who launched the first artificial earth satellite, the storming of the cosmos has begun. "It is to be expected that the time is not far off when the world will learn of the first Moon flight." ("On the Moon, by N. Barabashov, active member of the Academy of Sciences Ukrainian SSR, director of the Khar'kov Astronomical Observatory; Moscow, Izvestiya, 21 Nov 58, p 4)

IV. OCEANOGRAPHY

Mikhail Lomonosov Visits Newfoundland

A radio message from K. Bannov, First Mate, reports that the Mikhail Lomonosov, is under way again after a 6-day stay in the port of St Johns, Newfoundland.

The ship is operating in the North Atlantic conducting scientific observations under the IGY program. Ship and crew are reported in good condition.

While in port, the Lomonosov was visited by many of the city's residents. Among the guests was Dr Olsenhead of the expedition on the Canadian scientific research ship Cameron. ("In Autumn Storms," by K. Bannov, First Mate Mikhail Lomonosov; Moscow, Izvestiya, 29 Nov 58, p 4)

IGY Work by Soviets in Baltic

Two Soviet ships which are active in the work of the IGY program are the Professor Rudovits, a small auxiliary schooner, and the Okeanograf, a converted trawler.

Both of these ships operate in the southern part of the Baltic Sea. Following predetermined parallel courses 50 miles apart, the ships drop anchor five to six times a day. These oceanographic stations last about half an hour each. The expeditions conduct tens of stations, studying wave disturbances, temperatures, currents, salinity, density, and the chemical composition of the waters.

Daily reports on the number of stations conducted are radioed to the Leningrad Division of the State Oceanographic Institute by the chiefs of the expeditions: Yu. Mikhaylov, Candidate of Geographical Sciences, and K. Shirokov, engineer. ("In the Baltic Sea"; Leningrad, Leningradskaya Pravda, 10 Sep 58, p 4)

V. GLACIOLOGY

Studying El'brus' Glaciers

The El'brus expedition of the Geographic Faculty of the Moscow State University which Prof G. K. Tushinskiy heads, has returned to the capital. The expedition conducts work according to the IGY program. This summer its participants, together with associates of the Institute of Applied Geophysics, Academy of Sciences USSR, investigated the wide expanse of the glaciers on the summits and slopes of El'brus. It completed the collection of materials for compiling maps of the Glaciers. These will make it possible to determine changes in the magnitude of ice formation during the last 100 years and to compare these data with measurements of the Earth's climate.

The expedition in cooperation with the Institute of the Physics of the Earth, Academy of Sciences USSR, for the first time determined the thickness of the ice covering the El'brus. Scientific measurements of the ice temperatures and structures are also of great interest.

Today, in the Laboratory of Snow and ice of the Geographic Faculty (created in connection with the IGY) the investigation of samples of rocks, snow, and ice, procured from the eastern summit of El'brus was begun. ("Studying the Glaciers of El'brus"; Moscow, Vechernyaya Moskva, 15 Sep 58, p 3)

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